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(54) Injection molding sealing collar with a central hot tip shaft

Spritzgiessabdichtungsring mit einer zentralen Achse mit heisser Spitze

Collier d'étanchéité de moulage par injection ayant un axe central à pointe chaude

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DE-A- 3 201 710
GB-A- 1 158 389

- KUNSTSTOFFE vol. 71, no. 12, December 1981, MUNCHEN DE pages 855 - 861 UNGER, HÖRBURGER 'Erfahrungen mit einem Heisskanalsystem mit indirekt beheiztem Wärmeleittorpedo'

EP 0 546 554 B1

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Description

BACKGROUND OF THE INVENTION

This invention relates generally to injection molding and more particularly to injection molding apparatus having an unheated sealing and conductive member with a conductive hot tip shaft extending through an outer sealing collar mounted directly between a heated melt distribution manifold and a cooled cavity plate.

Kunststoffe, vol. 71, no. 12, December 91, pages 855 to 861 discloses a hot tip gated injection molding apparatus with a runner system. This document furthermore discloses an element (20) being positioned adjacent to the central conductive hot tip shaft as well as a plurality of cooled molds.

However, it would be apparent to those skilled in the art from figures 1 and 10 of this document that the element (20) of the prior art differs basically from the sealing and conductive member according to the present invention. First, it can be questioned whether or not the element (20) really provides a conductive function to the system. Unquestionable however is the fact that the element (20) is not in direct contact with the hot tip shaft (19). Therefore, if heat is received by element (20) this heat is not forwarded to the hot tip shaft (19) but merely to the melt flowing around the hot tip shaft.

Furthermore, it has to be recognised that the construction according to cited reference D1 provides different possible leakage areas, due to the fact that the hot tip shaft is connected by pressure with a distribution manifold. The element (20) is connected separately with its surrounding and needs to be sealed tightly against the surrounding in order to provide a clean cosmetic gate. Furthermore, a seal has to be provided against leakage of the pressurised melt into the insulative air space between the pressure sleeve of the hot tip and between the element (20). Consequently, not only the construction but also the maintenance of the apparatus, according to the prior art document, is very time consuming and the apparatus is very susceptible to leakage. Since a plurality of different elements are combined in the apparatus of prior document, problems resulting from the thermal expansion of the different elements is a further disadvantage. In order to provide a clean cosmetic gate it is essential that the hot tip aligns precisely with the gate. However, if the apparatus is assembled with the hot tip aligned precisely with the gate in the known document it will then travel sideways due to the thermal expansion when the apparatus is heated up by 250° to the operating temperature and the hot tip will then be very badly out of alignment. This can also cause damage to the hot tip. Additionally, in the document the melt is forced to flow through bores provided in a collar region of the hot tip. However, it should be noted that th bores can not be made large enough and th flow is turbulent. Furthermore, if the material which is processed is changed to a different collar there are disadvantages because there are dead spots upstream of the bores when material of the previous collar is trapped for a long time.

In contrast to the cited document the present invention provides a number of spaced ribs or blades which connect the collar portion of the sealing and conductive members with the hot tip. These blades are smoothly curved to avoid dead spots and minimise turbulence in the melt which flows between them around the hot tip shaft. Furthermore, the present invention reduces the dangerous leakage area to merely one, namely the leakage area between the hot manifold and the cooled cavity insert. However, this area can easily be sealed by the collar portion (52). Since the rear end of the collar portion abuts against the forward face of the heated manifold and the forward end of the collar portion is seated in the well in the cavity insert the hot tip can be precisely aligned with the gate and retained in that position. If the manifold expands due to the thermal expansion it slides along the rear end (60) of the collar portion (52).

Multi-cavity hot runner injection molding systems require a heated melt distribution manifold in which the melt passage branches towards the various gates through the cooled cavity plate. It is well known in the art to mount nozzles or probes having an electrical heating element to extend from the heated manifold into the cooled cavity plate to provide heat to the melt as it flows from the melt passage to the gates. The distinction between a nozzle and a probe is that the melt flows through a nozzle, whereas it flows around a probe. An example of a configuration using a heated probe is shown in the applicant's Canadian patent number 1,198,266 which issued December 24, 1985. While injection molding molds can have various configurations with numerous plates for different applications, the term "cavity insert" is used herein to indicate any plate or member through which the gate extends to the cavity, although in many other applications it may be called a cavity plate.

In configurations having heated nozzles abutting against the heated manifold, it is also known to mount a hot tip seal at the forward end of each nozzle. Examples of this in which the hot tip seal has a central pin portion or shaft in alignment with the gate are shown in the applicant's U.S. patent numbers 4,279,588 which issued July 21, 1981 and 4,450,999 which issued May 29, 1984 as well as U.S. patent number 4,266,723 to Osuna-Diaz which issued May 12, 1981. Similarly, the applicant's U.S. patent numbers 4,810,184 which issued March 7, 1989 and 5,028,227 which issued July 2, 1991 show an unheated ribbed torpedo assembly mounted between the forward end of each nozzle and a gate insert. However, all of these prior arrangements have the disadvantage that separate nozzles or probes having their own electrical heating element are required in addition to the heated manifold. Also, the requirement of nozzles or probes extending from the manifold limits reduction in mold height, which has become an important consideration in many applications.

The applicant's U.S. patent number 4,303,382 which issued December 1, 1981 discloses a heated nozzle having a forward tip portion with spiral channels which extend around a valve pin to impart a swirling motion to the melt flowing into the cavity. Similarly, the apparatus described in the applicant's Canadian patent number 1,165,525 which issued April 17, 1984 requires a heated nozzle having spiral blades to impart a swirling motion to the melt. Thus, all of the above prior apparatus has the disadvantages that it is relatively costly to manufacture, subject to malfunction, and requires additional mold height to install.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to at least partially overcome the problems of the prior art by providing an unheated sealing and conductive member with a conductive hot tip shaft extending through an outer sealing collar mounted directly between a heated melt distribution manifold and a cooled cavity insert.

To this end, in one of its aspects, the invention provides hot tip gated injection molding apparatus having a plurality of spaced gates, each gate extending centrally from a well in a cooled cavity insert to a respective cavity, a heated melt distribution manifold having a forward face mounted with an insulative air space extending between the forward face of the heated manifold and the cooled cavity insert, and a melt passage extending from a common inlet and branching in the manifold to a plurality of branches, each branch having a portion which extends forwardly to an outlet on the forward face of the manifold in alignment with one of the gates, a sealing and conductive member

having a central bore where through melt from the melt passage flows around a hot tip shaft to the gate, the hot tip shaft having a rear end and a forward end, the rear end of the hot tip shaft extending rearwardly past the rear end of the collar portion through the outlet on the forward face of the manifold a predetermined distance from the forwardly extending portion of a respective one of the melt passage branches, the forward end of the hot tip shaft being pointed and extending forwardly past the forward end of the collar portion a predetermined distance into the well in the cavity insert in alignment with the gates,

characterised in that the sealing and conductive member

having a plurality of spaced ribs which connect the elongated central conductive hot tip shaft

to a surrounding outer sealing collar portion is mounted between the heated manifold and the cooled cavity insert in alignment with each of the gates, the uter collar portion bridging the insulative air space betw en the heated manifold and the cooled cavity insert with the rear end of the collar portion abutting against the forward face

of the heated manifold and the forward end

of the collar portion being seated in the well in the cavity insert.

Further objects and advantages of the invention will appear from the following description, taken together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view of a multi-cavity injection molding system having sealing and conductive members mounted against the melt distribution manifold according to a preferred embodiment of the invention,

Figure 2 is a partial isometric view of one of the sealing and conductive members seen in Figure 1, and

Figure 3 is a plan view of the sealing and conductive member seen in Figure 2.

DETAILED DESCRIPTION OF THE DRAWINGS

Reference is first made to Figure 1 which shows a heated melt distribution manifold 10 mounted between a cooled back plate 12 and a cooled cavity insert 14. The manifold 10 has a cylindrical inlet portion 16 and an electrical heating element 18 as described in Mold-Masters Limited Canadian patent application serial number 2,044,793-1 filed June 13, 1991 entitled "Injection Molding Manifold with Integral Heated Inlet Portion." A melt passage 20 extends from a common inlet 22 in the inlet portion 16 and branches to a number of branches 24. Each branch 24 of the melt passage 20 has a forwardly extending portion 26 which leads to an outlet 28 on the forward face 30 of the manifold 10.

The cavity insert 14 has a well 32 with a central gate 34 leading to a cavity 36 in alignment with each outlet 28. As described in more detail below, a sealing and conductive member 38 according to the invention is mounted directly between the heated manifold 10 and the cooled cavity insert 14 in alignment with each of the aligned outlets 28 and gates 34. Double insulative and resilient spacer members 40 as described in the applicant's Canadian patent application serial number 2,022,123 filed July 27, 1990 entitled "Injection Molding Insulative and Resilient Spacer Member" are located between the manifold 10 and the back plate 12 by screws 42. The back plate 12 and the cavity insert 14 are cooled by pumping cooling water through cooling conduits 44. The back plate 12 is secured in position by retaining bolts 46 which extend into a cavity insert retainer plate 48. The back plate 12 applies a force through the spacer members 40 and the heated manifold 10 which holds the sealing and conductive members 38 securely in position. A central locating ring 49 is seated between the heated melt distribution manifold 10 and the cooled cavity insert retainer plate 48. Thus, the

heated melt distribution manifold 10 is located in a position which provides an insulative air space 50 between it and the surrounding cooled back plate 12 and cooled cavity insert 14. As is well known, this provides considerable thermal separation by minimizing actual steel to steel contact between the heated and cooled components of the mold.

Reference is now also made to Figures 2 and 3 which show the integral sealing and conductive member 38 in more detail. Each sealing and conductive member 38 has an outer sealing collar portion 52 and an elongated conductive hot tip shaft 54 which extends centrally through the bore 56 of the outer collar portion 52. A number of spaced ribs or blades 58 connect the collar portion 52 and the hot tip shaft 54 together. The collar portion 52 has a rear end 60 and a forward end 62. As seen in Figure 1, the rear end 60 abuts against the forward face 30 of the manifold 10, and the forward end 62 is received in a seat 64 in the well 32 in the cavity insert 14. Thus, the collar portion 52 provides a seal against leakage of the pressurized melt into the insulative air space 50 between the hot manifold 10 and cooled cavity insert 14. The force from the retaining bolts 46 is sufficient to eliminate leakage, but the rear end 60 of the collar portion 52 and the forward face 30 of the manifold 10 are sufficiently flat to allow adequate sliding movement between them to accommodate thermal expansion. In this embodiment, a portion 66 of the outer surface of the collar portion 52 curves outwardly towards the rear. Thus, the collar portion 52 is thicker at the rear end 60 where it extends into the air space 50 and contacts the forward face 30 of the heated manifold 10 than at the forward end 62 where it is received in the seat 64 in the cooled cavity insert 14. This increases the heat received through the rear end 60 from the heated manifold 10 and reduces the heat loss through the forward end 62 to the cooled cavity insert 14. As can be seen, the rear end 60 of the collar portion 52 is directly adjacent the heating element 18 in the forward face 30 of the manifold which also improves the heat transfer from that forward face 30 to the collar portion 52. The thermal conductivity of the sealing and conductive members 38 is critical to the successful operation of the system because they do not have a separate heating element. Thus, the shape, dimensions and composition of the different portions can be varied to provide different thermal characteristics for different applications.

The elongated hot tip shaft 54 of the sealing and conductive member 38 extends centrally in the bore 56 of the collar portion 52, but is considerably longer than the collar portion 52. Thus, the rear end 68 of the hot tip shaft 54 which is smoothly rounded in this embodiment extends rearwardly past the rear end 60 of the collar portion 52 through the outlet 28 and centrally into the forwardly extending portion 26 of the melt passage 20. Similarly, the forward end 70 of the hot tip shaft 54 which has a pointed tip extends forwardly past the forward end 62 of the collar portion 52 centrally into the well 32 in alignment with the gate 34. The pointed tip 70 of the hot tip shaft 54 usually extends into the gate 34 itself which is also tapered, but its precise location is determined by the thermal requirements of the particular application. As best seen in Figure 2, the hot tip shaft 54 has an inner portion 72 surrounded by a thin outer portion 74. The inner portion 72 is made of a highly thermally conductive material such as silver or copper, and the outer portion 74 is made of an abrasion and corrosion resistant material such as high speed steel. Thus, the outer portion 74 is able to withstand wear from the pressurized melt flowing around it, particularly in the area of the gate 34 and the inner portion 72 very effectively conducts heat to and from the area of the gate 34 during different portions of the injection cycle.

As can be seen, in this embodiment three spiral blades 58 extend outwardly from the hot tip shaft 54 to connect it to the surrounding collar portion 52. These blades 58 are smoothly curved to avoid dead spots and minimize turbulence in the melt which flows between them around the hot tip shaft 54. The spiral shape of the blades 58 imparts a swirling motion to the melt entering the cavity 36 which strengthens the molded product around the gate area. In applications where this is not a concern, the sealing and conductive members 38 can have straight ribs or vanes which extend radially rather than the spiral blades 58. Thus, the number and shape of the blades or ribs 58 are dependent upon the requirements of the particular application. In this embodiment, the outer collar portion 52 and blades 58 are cast of hot-work steel and are integrally brazed to the hot tip shaft 54. Thus, a metallurgically monolithic integral sealing and conductive member 38 is formed which effectively conducts heat from the rear end 60 of the collar portion 52 through the blades 58 as well as along the elongated hot tip shaft 54.

In use, the injection molding system is assembled as shown in Figure 1. While a system having only two cavities 36 has been shown for ease of illustration, it will be appreciated that the melt distribution manifold 10 normally has many more melt passage branches 24 extending to numerous cavities 36 depending on the application. Electrical power is applied to the heating element 18 in the manifold 10 to heat it to a predetermined operating temperature. Pressurized melt from a molding machine (not shown) is then injected into the melt passage 20 through the common inlet 22 according to a predetermined cycle in a conventional manner. The pressurized melt flows into the forwardly extending portions 26 of the branches 24 of the melt passage 20 and through the sealing and conductive members 38 to the gates 34 to fill the cavities 36. After the cavities 36 are filled, injection pressure is held momentarily to pack and then released. After a short cooling period, the mold is opened to eject the molded products. After ejection, the mold is closed and injection pressure is reapplied to refill the cavities 36. This cycle is continuously repeated with a frequency dependent on the size and shape of the cavities and the type of material being molded. During injection the hot tip shaft 54 conducts

excess heat which is generated by friction of the melt flowing through the constricted area of the gate 34 rearwardly to avoid stringing and drooling of the melt when the mold opens for ejection. After melt has stopped flowing, solidification in the gate is enhanced by the removal of the excess friction heat through the hot tip shaft 54. Shortly after the excess friction heat has been removed, the direction of flow of heat along the hot tip shaft 54 reverses. Heat received from the heated manifold 10 through the rear end 60 of the collar portion 52 and also from the rear end 68 of the hot tip shaft 54 which extends into the hot melt in the melt passage 20 in the heated manifold 10 is conducted forwardly along the hot tip shaft 54 to the area of the gate 34. This additional heat prevents the melt freezing in the area of the gate 34 to the extent that it forms a solid plug which would interfere with injection when injection pressure is reapplied after the mold is closed.

While the description of the sealing and conductive members 38 has been given with respect to preferred embodiments, it will be evident that various modifications are possible without departing from the scope of the invention as understood by those skilled in the art and as defined in the following claims.

Claims

1. A hot tip gated injection molding apparatus having a plurality of spaced gates, each gate (34) extending centrally from a well (32) in a cooled cavity insert (14) to a respective cavity (36), a heated melt distribution manifold (10) having a forward face (30) mounted with an insulative air space (50) extending between the forward face (30) of the heated manifold (10) and the cooled cavity insert (14) and a melt passage (20) extending from a common inlet (22) and branching in the manifold (10) to a plurality of branches (24), each branch (24) having a portion (26) which extends forwardly to an outlet (28) on the forward face (30) of the manifold (10) in alignment with one of the gates (44), a sealing and conductive member (38) having a central bore where through melt from the melt passage flows around a hot tip shaft (55) to the gate, the hot tip shaft (55) having a rear end and a forward end, the rear end of the hot tip shaft extending rearwardly past the rear end of the collar portion through the outlet on the forward face of the manifold (10) a predetermined distance from the forwardly extending portion of a respective one of the melt passage branches, the forward end of the hot tip shaft being pointed and extending forwardly past the forward end (62) of the collar portion (52) a predetermined distance into the well (32) in the cavity insert (14) in alignment with the gates (34),
characterised in that the sealing and conductive member (38) having a plurality of spaced ribs (58) which connect the elongated central conductive hot tip shaft (54) to a surrounding outer sealing collar portion (52) is mounted between the heated manifold (10) and the co led cavity insert (14) in alignment with each of the gates, the outer collar portion bridging the insulative air space (50) between the heated manifold (10) and the cooled cavity insert (14) with the rear end (60) of the collar portion (52) abutting against the forward face (30) of the heated manifold (10) and the forward end (62) of the collar portion (52) being seated in the well (32) in the cavity insert (14).

2. Hot tip gated injection molding apparatus as claimed in claim 1 wherein the hot tip shaft has a highly thermally conductive inner portion and an abrasion resistant outer portion.

3. Hot tip gated injection molding apparatus as claimed in claim 2 wherein the outer portion of the hot tip shaft is formed of high speed steel.

4. Hot tip gated injection molding apparatus as claimed in claim 3 wherein the inner portion of the hot tip shaft is formed of silver.

5. Hot tip gated injection molding apparatus as claimed in claim 3 wherein the inner portion of the hot tip shaft is formed of copper.

6. Hot tip gated injection molding apparatus as claimed in claim 2 wherein the spaced ribs connecting the central hot tip shaft to the surrounding outer collar portion have the shape of spiral blades which impart a swirling motion to the melt flowing between them to the gate.

7. Hot tip gated injection molding apparatus as claimed in claim 2 wherein the outer collar portion is substantially thicker at the rear end than at the forward end.

8. Hot tip gated injection molding apparatus as claimed in claim 2 wherein the rear end of the collar portion and the forward face of the manifold against which the rear end of the collar portion abuts are sufficiently flat to allow sufficient relative movement therebetween to provide for thermal expansion.

Patentansprüche

1. Spritzgießvorrichtung mit Anschnitt mit heißer Spitze und mit einer Vielzahl von mit Zwischenraum angeordneten Anschnitten, wobei sich jeder Anschnitt (34) von einem Schacht (32) in einen gekühlten Hohlraumeinsatz (14) zu einem entsprechenden Hohlraum (36) erstreckt, und mit einem gewärmten Schmelzeverteilungsleitungssystem (10) mit einer vorderen Seite (30), welche mit einem Luftspalt befestigt ist, welcher sich zwischen der vorderen Seite (30) des erwärmten Leitungssy-

stem und dem gekühlten Hohlraumeinsatz (14) erstreckt und mit einem Schmelzedurchgang (20), welcher sich von einem gemeinsamen Einlaß (22) erstreckt und in eine Vielzahl von Abzweigungen (24) verzweigt, wobei jede Abzweigung (24) einen Bereich (26) aufweist, welcher sich nach vorne zu einem Auslaß (28) in der vorderen Seite (30) des Leitungssystems (10) in Ausrichtung mit einem der Anschnitte (44) erstreckt, mit einem abdichtenden und leitenden Element (38) mit einer zentralen Bohrung, durch welche Scmelze von einem Schmelzedurchgang um eine Achse (55) der heißen Spitze zu dem Anschnitt fließt, wobei sich das hintere Ende der Achse (55) der heißen Spitze nach hinten zu dem hinteren Ende des Randbereichs durch den Auslaß in der vorderen Seite des Leitungssystems (10) eine vorbestimmte Entfernung von dem sich nach vorne erstreckenden Bereich einer betreffenden der Schmelzedurchgangabzweigungen erstreckt und das vordere Ende der Achse der heißen Spitze zugespitzt ist und über das vordere Ende (62) des Randbereichs (52) eine vorbestimmte Entfernung in den Schacht (32) in dem Hohlraumeinsatz (14) in Ausrichtung mit den Anschnitten (34)erstreckt,
dadurch gekennzeichnet,
daß das abdichtende und leitende Element (38) eine Vielzahl von mit Zwischenraum angeordneten Rippen (58) aufweist, welche die längliche zentrale Achse (54) der heißen Spitze mit einem umgebenden äußeren Randbereich (52) verbinden, zwischen dem erwärmten Leitungssystem (10) und dem gekühlten Hohlraumeinsatz (14) in Ausrichtung mit jedem der Anschnitte befestigt ist, der äußere Randbereich den isolierenden Luftspalt (50) zwischen dem erwärmten Leitungssystem (10) und dem gekühlten Hohlraumeinsatz (14) überbrückt, wobei das hintere Ende (60) des Randbereichs (52) gegen die vordere Seite (30) des erwärmten Leitungssystems (10)stößt und das vordere Ende (62) des Randbereichs (52) in dem Schacht (32) in dem Hohlraumeinsatz (14) gelagert ist.

2. Spritzgießvorrichtung mit Anschnitt mit heißer Spitze nach Anspruch 1, wobei die Achse der heißen Spitze einen thermisch hochleitfähigen inneren Bereich und einen verschleißbeständigen äußeren Bereich aufweist.

3. Spritzgießvorrichtung mit Anschnitt mit heißer Spitze nach Anspruch 2, wobei der äußere Bereich der Achse der heißen Spitze aus Schnellarbeitsstahl gebildet ist.

4. Spritzgießvorrichtung mit Anschnitt mit heißer Spitz nach Anspruch 3, wobei der innere Bereich der Achse der heißen Spitze aus Silber gebildet ist.

5. Spritzgießvorrichtung mit Anschnitt mit heißer Spitze nach Anspruch 3, wobei der innere Bereich der Achse der heißen Spitze aus Kupfer gebildet ist.

6. Spritzgießvorrichtung mit Anschnitt mit heißer Spitze nach Anspruch 2, wobei die mit Zwischenraum angeordneten Rippen, welche die zentrale Achse der heißen Spitze mit dem umgebenden äußeren Randbereich verbinden, die Form von spiralförmigen Schaufeln bzw. Blättern aufweisen, welche der zwischen diesen zu dem Anschnitt fließenden Schmelze eine wirbelnde Bewegung verleihen.

7. Spritzgießvorrichtung mit Anschnitt mit heißer Spitze nach Anspruch 2, wobei der äußere Randbereich an dem hinteren Ende wesentlich dicker als an dem vorderen Ende ist.

8. Spritzgießvorrichtung mit Anschnitt mit heißer Spitze nach Anspruch 2, wobei das hintere Ende des Randbereiches und die vordere Seite des Leitungssystemes, gegen welches das hintere Ende des Randbereiches stößt, ausreichend flach sind, um eine relative Bewegung zwischen diesen zu gewährleisten, um eine thermische Ausdehnung bereitzustellen.

Revendications

1. Appareil de moulage par injection à entrée à pointe chaude, ayant une pluralité d'entrées espacées, chaque entrée (34) s'étendant centralement depuis un puits (32) ménagé dans une pièce rapportée à cavité (14) refroidie, vers une cavité (36) respective, un collecteur de distribution de produit en fusion (10) chauffé ayant une face avant (30) montée avec un espace d'air isolant (50) s'étendant entre la face avant (30) du collecteur chauffé (10) et la pièce rapportée à cavité (14) refroidie, et un passage de produit en fusion (20) s'étendant depuis une entrée commune (22) et se ramifiant dans le collecteur (10) vers une pluralité de ramifications (24), chaque ramification (24) ayant une partie (26) qui s'étend vers l'avant vers une sortie (28) se trouvant sur la face avant (30) du collecteur (10), en alignement avec l'une des entrées (44), un organe d'étanchéité et conducteur (38) ayant un alésage central dans lequel un produit en fusion provenant du passage de produit en fusion s'écoule autour d'un axe à pointe chaude (55) vers l'entrée, l'axe à pointe chaude (55) ayant une extrémité arrière et une extrémité avant, l'extrémité arrière de l'axe à pointe chaude s'étendant vers l'arrière au-delà de l'extrémité arrière de la partie de collier, à travers la sortie se trouvant sur la face avant du collecteur (10), à une distance prédéterminé de la partie s'étendant vers l'avant d'une ramification respective parmi les

ramifications de passage de produit en fusion, l'extrémité avant de l'axe à pointe chaude étant pointue et s'étendant vers l'avant au-delà de l'extrémité avant (62) de la partie de collier (52), sur une distance prédéterminée dans le puits (32) ménagé dans la pièce rapportée à cavité (14), en alignement avec les entrées (34), caractérisé en ce que l'organe d'étanchéité et conducteur (38), ayant une pluralité de nervures espacées (58) qui relient l'axe à pointe chaude (54) conducteur central allongé à une partie de collier d'étanchéité (52) extérieure environnante, est monté entre le collecteur chauffé (10) et la pièce rapportée à cavité (14) refroidie, en alignement avec chacune des entrées, la partie de collier extérieure enjambant l'espace d'air isolant (50) entre le collecteur chauffé (10) et la pièce rapportée à cavité (14) refroidie, tandis que l'extrémité arrière (60) de la partie de collier (52) bute contre la face avant (30) du collecteur chauffé (10), et l'extrémité avant (62) de la partie de collier (52) étant placée dans le puits (32) ménagé dans la pièce rapportée à cavité (14).

2. Appareil de moulage par injection à entrée à pointe chaude selon la revendication 1, dans lequel l'axe à pointe chaude présente une partie intérieure à haute conduction thermique et une partie extérieure résistant à l'abrasion.

3. Appareil de moulage par injection à entrée à pointe chaude selon la revendication 2, dans lequel la partie extérieure de l'axe à pointe chaude est réalisée en un acier rapide.

4. Appareil de moulage par injection à entrée à pointe chaude selon la revendication 3, dans lequel la partie intérieure de l'axe à pointe chaude est réalisée en argent.

5. Appareil de moulage par injection à entrée à pointe chaude selon la revendication 3, dans lequel la partie intérieure de l'axe à pointe chaude est réalisée en cuivre.

6. Appareil de moulage par injection à entrée à pointe chaude selon la revendication 2, dans lequel les nervures espacées reliant l'axe central à pointe chaude à la partie de collier extérieure environnante présentent la forme de pales à spires qui impriment un mouvement de tourbillonnement au produit en fusion s'écoulant entre elles, vers l'entrée.

7. Appareil de moulage par injection à entrée à pointe chaude selon la revendication 2, dans lequel la partie de collier extérieure est sensiblement plus épaisse à l'extrémité arrière, qu'à l'extrémité avant.

8. Appareil de moulage par injection à entrée à pointe chaude selon la revendication 2, dans lequel l'extrémité arrière de la partie de collier et la face avant du collecteur contre lequel bute l'extrémité arrière de la partie de collier sont suffisamment planes pour permettre un mouvement relatif suffisant entre elles, afin de permettre une dilatation thermique.

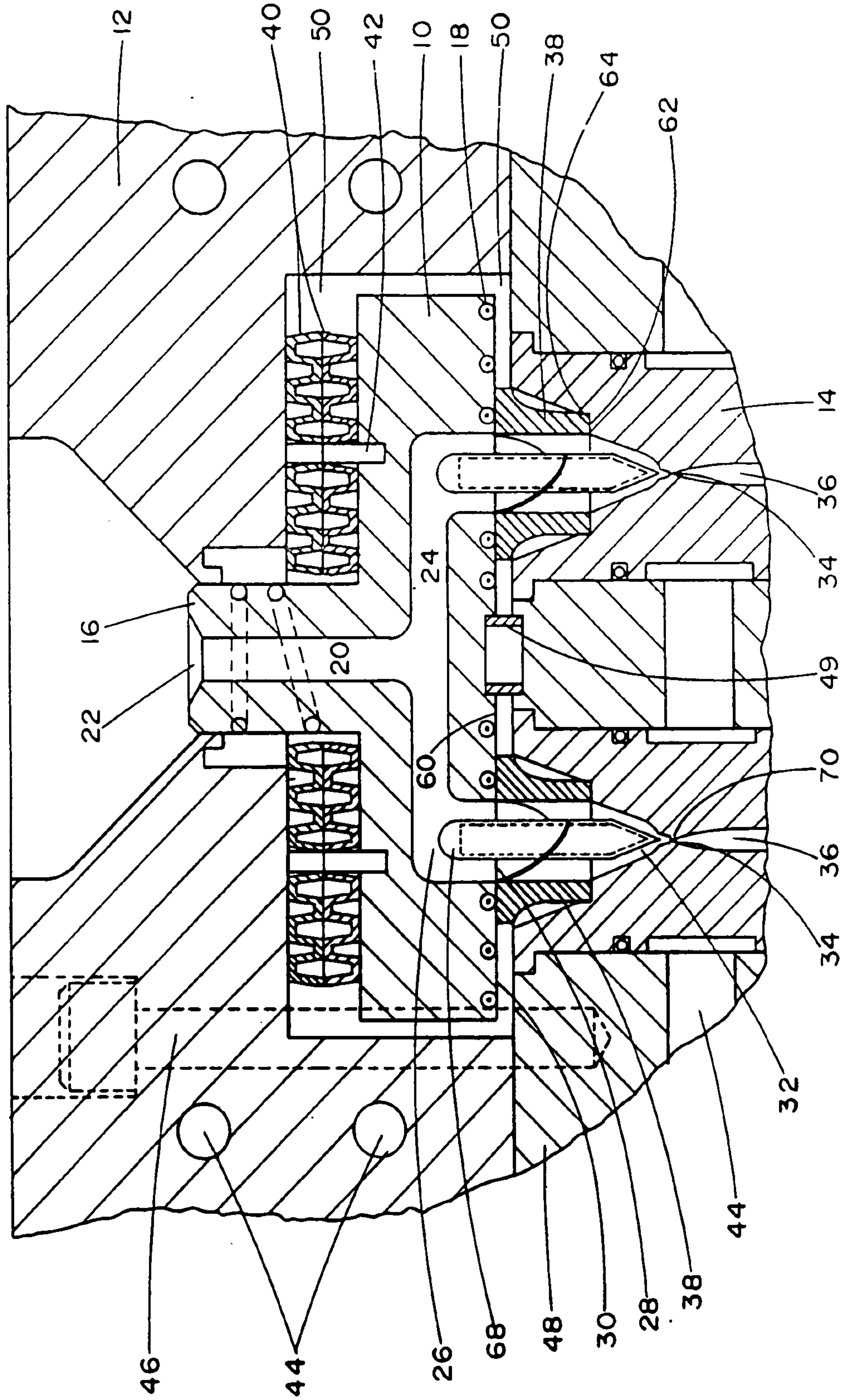
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Fig 1

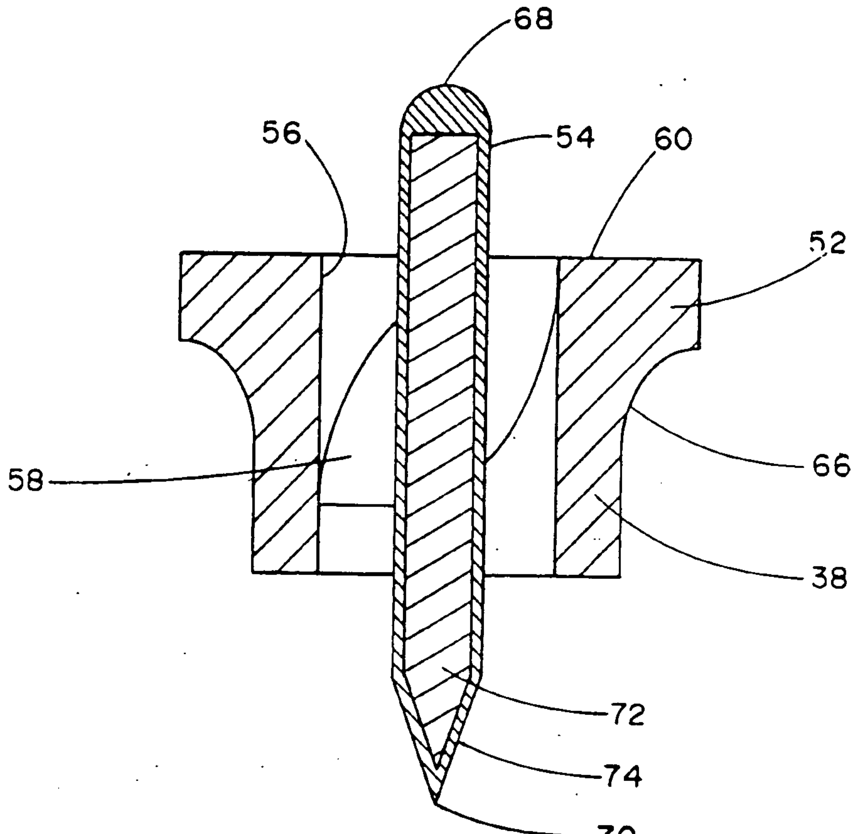

Fig 2

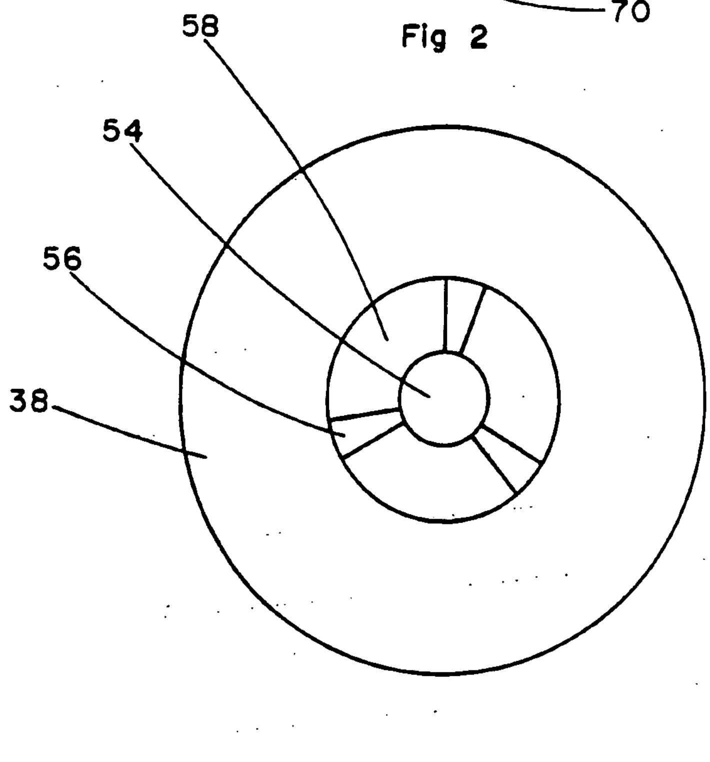

Fig 3